

In the Claims:

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1. (Previously Presented): A method comprising:

receiving a first packet of information on an input optical signal that occupies a plurality of input channels, each input channel being included in one among an input plurality of distinct wavelength ranges that are respectively in selected International Telecommunication Union (ITU) WDM windows; and

transmitting the first packet of information on an output optical signal that occupies a plurality of output channels, each output channel being included in one among an output plurality of distinct wavelength ranges,

wherein the plurality of input channels includes at least a plurality of adjacent WDM channels within one ITU WDM window which comprise:

(A) a reserved wavelength buffer selected from one of the plurality of adjacent WDM channels within the one ITU WDM window; and

(B) a channel on which the first packet is received, wherein the plurality of output channels includes an active wavelength buffer on which the first packet is transmitted, and

wherein each among the input plurality of wavelength ranges is associated, in order of increasing wavelength, with one among the output plurality of wavelength ranges in order of increasing wavelength, the wavelength range including the reserved wavelength buffer being associated with the wavelength range including the active wavelength buffer.

2. (original): A method as in claim 1 further comprising:  
transmitting, prior to the receiving, information including the first packet on the input optical signal, the transmitting including reserving the reserved wavelength buffer.

3. (original): A method as in claim 1, further comprising receiving an additional input optical signal having a second packet of information wherein the second packet of information is carried within the additional input optical signal over substantially the channel on which the first packet is received.

4. (original): A method as in claim 1, further comprising:  
prior to transmitting the first packet of information on the output optical signal, extracting label information from the

input optical signal, the label information including  
information about the first packet of information;

generating a control signal according to at least a portion  
of the label information;

controlling a signal-producing component to reproduce the  
first packet of information within the output optical signal in  
the active wavelength buffer; and

re-associating the label information with the first packet  
of information.

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5. (Previously Presented): A method as in claim 4, wherein  
the label information is carried within the input signal in a  
channel distinct from an input channel that carries data and  
distinct from the reserved wavelength buffer and within the  
output signal in a channel distinct from the active wavelength  
buffer.

6. (Currently Amended): ~~A method comprising:~~  
~~receiving a first packet of information on an input optical~~  
~~signal that occupies a plurality of input channels, each input~~  
~~channel being included in one among an input plurality of~~  
~~distinct wavelength ranges;~~

~~transmitting the first packet of information on an output  
optical signal that is optically obtained from the input optical  
signal and occupies a plurality of output channels, each output  
channel being included in one among an output plurality of  
distinct wavelength ranges,~~

~~wherein the plurality of input channels includes:~~

~~—— (A) a reserved wavelength buffer; and~~

~~—— (B) a channel on which the first packet is received,~~

~~wherein the plurality of output channels includes an active  
wavelength buffer on which the first packet is transmitted, and~~

~~wherein each among the input plurality of wavelength ranges  
is associated, in order of increasing wavelength, with one among  
the output plurality of wavelength ranges in order of increasing  
wavelength, the wavelength range including the reserved  
wavelength buffer being associated with the wavelength range  
including the active wavelength buffer;~~

~~prior to transmitting the first packet of information on  
the output optical signal, extracting label information from the  
input optical signal, the label information including  
information about the first packet of information ;~~

~~generating a control signal according to at least a portion  
of the label information;~~

~~controlling a signal-producing component to reproduce the  
first packet of information within the output optical signal in  
the active wavelength buffer, and~~

~~re-associating the label information with the first packet  
of information, A method as in claim 4, wherein the signal-  
producing component comprises:~~

a local oscillator controlled by the control signal to  
produce a local oscillator signal, and

a modulator, accepting as one input, the local oscillator  
signal, and as another input, a signal representing the first  
packet of information, the modulator further producing as an  
output, a modulated output signal including the first packet of  
information.

7. (original): A method as in claim 6, wherein a frequency  
of the local oscillator signal corresponds to a difference in  
frequency between the channel on which the first packet is  
received and the active wavelength buffer.

8. (Currently Amended): A method as in claim 6, wherein  
the modulator is a Mach-Zehnder ~~Zender~~ modulator.

9. (original): A method as in claim 4, wherein the signal-producing component comprises:

a laser, controlled according to the control signal to produce a laser signal, and

a semiconductor optical amplifier, accepting as one input the laser signal, and as another input a signal representing the first packet of information, the semiconductor optical amplifier further producing as an output, a modulated output signal including the first packet of information.

10. (Currently Amended): A method comprising:

receiving a first packet of information on an input optical signal that occupies a plurality of input channels, each input channel being included in one among an input plurality of distinct wavelength ranges;

transmitting the first packet of information on an output optical signal that occupies a plurality of output channels, each output channel being included in one among an output plurality of distinct wavelength ranges,

wherein the plurality of input channels includes at least a plurality of adjacent WDM channels within one International Telecommunication Union (ITU) WDM window which comprise:

(A) a reserved wavelength buffer, and

(B) a channel on which the first packet is received,

wherein the plurality of output channels includes an active wavelength buffer on which the first packet is transmitted, and

wherein each among the input plurality of wavelength ranges is associated, in order of increasing wavelength, with one among the output plurality of wavelength ranges in order of increasing wavelength, the wavelength range including the reserved wavelength buffer being associated with the wavelength range including the active wavelength buffer;

prior to transmitting the first packet of information on the output optical signal, extracting label information from the input optical signal, the label information including information about the first packet of information;

generating a control signal according to at least a portion of the label information;

controlling a signal-producing component to reproduce the first packet of information within the output optical signal in the active wavelength buffer; and

re-associating the label information with the first packet of information ,

wherein the signal-producing component comprises:

a laser, controlled according to the control signal to produce a laser signal, and

a semiconductor optical amplifier, accepting as one input the laser signal, and as another input a signal representing the first packet of information, the semiconductor optical amplifier further producing as an output, a modulated output signal including the first packet of information, wherein the laser signal has a frequency which corresponds to a difference in frequency between the channel on which the first packet is received and the active wavelength buffer.

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11. (original): A method as in claim 1, further comprising:  
extracting label information, the first packet of information, and a carrier from the input optical signal;  
producing a first electronic signal representing information from the first packet of information; and  
producing a second electronic signal representing the label information,

wherein transmitting the first packet of information further comprises modulating the carrier with the first and second electronic signals to produce the output optical signal.



12. (original): A method as in claim 1, further comprising:  
extracting label information and the first packet of  
information from the input optical signal;  
producing a first electronic signal representing  
information from the first packet of information;  
producing a second electronic signal representing the label  
information; and  
controlling a first and second laser diode according to the  
first and second electronic signals, respectively, to produce  
the output optical signal.

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13. (Previously Presented): A device comprising:  
an optical receiver, the optical receiver configured and  
arranged to receive a first packet of information on an input  
optical signal that occupies a plurality of input channels, each  
input channel being included in one among an input plurality of  
wavelength ranges that are respectively in selected  
International Telecommunication Union (ITU) WDM windows;  
and an optical transmitter, the optical transmitter being  
configured and arranged to transmit an output optical signal  
that occupies a plurality of output channels, each output

channel being included in one among an output plurality of wavelength ranges,

wherein the plurality of input channels includes at least a plurality of adjacent WDM channels within one ITU WDM window which comprise:

(A) a reserved wavelength buffer selected from one of the plurality of adjacent WDM channels within the one ITU WDM window; and

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(B) a channel on which the first packet is received, wherein the plurality of output channels includes an active wavelength buffer on which the first packet is transmitted, and

wherein each among the input range of wavelength portions is associated, in order of increasing wavelength, with one among the output plurality of wavelength ranges in order of increasing wavelength, the wavelength range occupied by the reserved wavelength buffer being associated with the wavelength range occupied by the active wavelength buffer.

14. (original): A device as in claim 13, wherein the optical receiver is further configured and arranged to receive an additional input optical signal having a second packet of information wherein the second packet of information is carried

within the second input optical signal over substantially the channel on which the first packet is received.

15. (original): A device as in claim 13, further comprising:

a label reader, configured and arranged to, prior to the transmitting of the output optical signal, extract label information from the input optical signal, the label information including information about the first packet of information;

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a control signal generator, configured and arranged to generate a control signal according to at least a portion of the label information;

a signal-producing component, configured and arranged to reproduce the first packet of information within the output optical signal in the active wavelength buffer; and

a labeling component, configured and arranged to associate the label information with the first packet of information.

16. (Currently Amended): ~~A device comprising:~~  
~~an optical receiver, the optical receiver configured and~~  
~~arranged to receive a first packet of information on an input~~  
~~optical signal that occupies a plurality of input channels, each~~

~~input channel being included in one among an input plurality of  
wavelength rang, and~~

~~an optical transmitter, the optical transmitter being  
configured and arranged to transmit an output optical signal  
that occupies a plurality of output channels, each output  
channel being included in one among an output plurality of  
wavelength ranges,~~

~~wherein the plurality of input channels includes:~~

~~—— (A) a reserved wavelength buffer, and~~

~~—— (B) a channel on which the first packet is received,~~

~~wherein the plurality of output channels includes an active  
wavelength buffer on which the first packet is transmitted, and~~

~~wherein each among the input range of wavelength portions  
is associated, in order of increasing wavelength, with one among  
the output plurality of wavelength ranges in order of increasing  
wavelength, the wavelength range occupied by the reserved  
wavelength buffer being associated with the wavelength range  
occupied by the active wavelength buffer, A device as in claim~~

13, wherein the signal-producing component comprises:

a local oscillator controlled by the control signal to  
produce a local oscillator signal, and

a modulator, accepting as one input, the local oscillator signal, and as another input, a signal representing the first packet of information, the modulator further producing as an output, a modulated output signal including the first packet of information.

17. (original): A device as in claim 16, wherein a frequency of the local oscillator signal corresponds to a difference in frequency between the channel on which the first packet is received and the active wavelength buffer.

18. (original): A device as in claim 16, wherein the modulator is a Mach-Zender modulator.

19. (original): A device as in claim 15, wherein the signal-producing component comprises:

a laser, controlled according to the control signal to produce a laser signal, and

a semiconductor optical amplifier, accepting as one input the laser signal, and as another input a signal representing the first packet of information, the semiconductor optical amplifier

further producing as an output, a modulated output signal including the first packet of information.

20. (Currently Amended): A device comprising:

an optical receiver, the optical receiver configured and arranged to receive a first packet of information on an input optical signal that occupies a plurality of input channels, each input channel being included in one among an input plurality of wavelength ranges;

and an optical transmitter, the optical transmitter being configured and arranged to transmit an output optical signal that occupies a plurality of output channels, each output channel being included in one among an output plurality of wavelength ranges,

wherein the plurality of input channels includes at least a plurality of adjacent WDM channels within one International Telecommunication Union (ITU) WDM window which comprise :

(A) a reserved wavelength buffer, and

(B) a channel on which the first packet is received,

wherein the plurality of output channels includes an active wavelength buffer on which the first packet is transmitted, and

wherein each among the input range of wavelength portions is associated, in order of increasing wavelength, with one among the output plurality of wavelength ranges in order of increasing wavelength, the wavelength range occupied by the reserved wavelength buffer being associated with the wavelength range occupied by the active wavelength buffer;

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a label reader, configured and arranged to, prior to the transmitting of the output optical signal, extract label information from the input optical signal, the label information including information about the first packet of information;

a control signal generator, configured and arranged to generate a control signal according to at least a portion of the label information;

a signal-producing component, configured and arranged to reproduce the first packet of information within the output optical signal in the active wavelength buffer; and

a labeling component, configured and arranged to associate the label information with the first packet of information

wherein the signal-producing component comprises:

a laser, controlled according to the control signal to produce a laser signal, and

a semiconductor optical amplifier, accepting as one input the laser signal, and as another input a signal representing the first packet of information, the semiconductor optical amplifier further producing as an output, a modulated output signal including the first packet of information, and

wherein the laser signal has a frequency which corresponds to a difference in frequency between the channel on which the first packet is received and the active wavelength buffer.

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21. (original): A device as in claim 13, wherein the input optical signal includes a carrier signal and label information, the device further comprising:

at least one filter, configured and arranged to extract the carrier signal from the input optical signal;

a label reader, configured and arranged to extract label information from the input optical signal;

a label writer, configured and arranged to produce a first electronic signal representing the extracted label information;

a signal regenerator, configured and arranged to produce a second electronic signal representing the first packet of information; and



a modulator configured and arranged to modulate the carrier with the first and second electronic signals to produce the output optical signal.

22. (original): A device as in claim 13, further comprising:

a label writer, configured and arranged to produce a first electronic signal representing the label information;

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a signal regenerator, configured and arranged to produce a second electronic signal representing the first packet of information; and

a first and second laser diode, controlled according to the first and second electronic signals, respectively, to produce the output optical signal.

23. (Previously Presented): A method of transmitting a signal, comprising:

receiving a broadband input optical signal including a payload and label information that are carried in a plurality of input WDM channels that are respectively within selected International Telecommunication Union (ITU) WDM windows, wherein each ITU WDM window includes a plurality of adjacent input WDM

channels with one selected input WDM channel being empty as a buffer;

receiving the label information with a baseband optical receiver;

modifying the label information to produce modified label information; and

re-combining the modified label information with the payload to produce an output optical signal including the payload and the modified label information.

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24. (Previously Presented): A device, comprising:

an optical input port to receive a wavelength-division multiplexed (WDM) signal having a plurality of different WDM channels within each single International Telecommunication Union (ITU) WDM window, wherein at least one of the WDM channels is empty and is reserved as a buffer channel;

an optical splitter to split the received WDM signal into a first optical signal and a second optical signal;

a first optical filter to filter the first optical signal to produce an optical label signal which carries only label information of each WDM channel;

a second optical filter to filter the second optical signal to produce an optical data signal which carries data of each WDM channel without the label information;

an optical modulator to modulate the optical data signal at a selected local oscillator frequency to shift a selected WDM channel by the selected local oscillator frequency to fall within the buffer channel;

a label unit to receive the optical label signal and to produce a new optical label channel to reflect channel shifting done by said optical modulator; and

an optical combiner to combine the optical label channel and the optical data signal output from said optical modulator to produce a new WDM signal.

25. (Previously Presented): The device as in claim 24, wherein said label unit includes:

a tunable laser to produce a laser carrier at a label channel frequency;

a second optical modulator responding to label information in the first optical signal to modulate the laser carrier and to produce the new optical label channel; and

an optical delay line to cause a delay in the new optical label channel to synchronize with the optical data signal output at said optical combiner.

26. (Previously Presented): The device as in claim 24, wherein said label unit includes:

a first optical receiver to convert the first optical signal into a first electrical signal; and

a label processor to extract the label information from the first electrical signal.

27. (Previously Presented): The device as in claim 26, wherein the label unit further comprises a local oscillator to produce a signal at the selected local oscillator frequency which controls said optical modulator, wherein said local oscillator is coupled to said label processor.

28. (Previously Presented): The device as in claim 27, wherein said local oscillator includes a tunable laser to produce a pump laser beam at the selected local oscillator frequency, and wherein said optical modulator includes a semiconductor optical amplifier modulator which changes an

optical gain for the second optical signal in response to the pump laser beam.

29. (Previously Presented): The device as in claim 24, further comprising:

a second optical splitter to split a part of the second optical signal as a label optical carrier signal to the label unit,

wherein said label unit includes:

an optical bandpass filter to filter the label optical carrier signal to remove modulation bands, and

a second optical modulator to modulate the filtered label optical carrier signal in response to the label information in the first optical signal to produce the new optical label channel.

30. (Currently Amended): A method, comprising:

splitting a received wavelength-division multiplexed (WDM) signal into a first optical signal and a second optical signal, wherein the received WDM signal includes a plurality of different WDM channels within each single International

Telecommunication Union (ITU) WDM window and at least one of the WDM channel is empty and is reserved as a buffer channel;

filtering the first optical signal to produce an optical label signal which carries only label information of each WDM channel;

filtering the second optical signal to produce an optical data signal which carries data of each WDM channel without corresponding label information;

*B' crit* **optically** modulating the optical data signal at a selected local oscillator frequency to shift a selected WDM channel by the selected local oscillator frequency to the buffer channel;

producing a new optical label channel to reflect updated channel information after channel shifting in the optical modulation; and

combining the new optical label channel and the optical data signal after the optical modulation to produce a new WDM signal.

31. (Previously Presented): A device, comprising:

an optical input port to receive a wavelength-division multiplexed (WDM) signal having a plurality of different WDM channels within each single International Telecommunication

Union (ITU) WDM window, wherein at least one of the WDM channel is empty and is reserved as a buffer channel;

an optical splitter to split the received WDM signal into first, second and third optical signals;

a label processing module to process label information in the first optical signal to produce a first electrical control signal having new label information for a channel shifting

arrangement;

an optical filter to filter the second optical signal to remove modulation bands thereon to produce an optical carrier signal;

a data signal regenerator to receive the third optical signal to process data in each WDM channel in the third optical signal to generate a second electrical control signal having data in the received WDM signal; and

an optical modulator to modulate the optical carrier signal in response to the first and the second electrical control signals to shift a selected WDM channel to the buffer channel according to the channel shifting arrangement to produce a new WDM signal.

32. (Previously Presented): The device as in claim 31,

wherein the signal regenerator comprises:

an optical filter to filter and remove label information  
from the third optical signal;

an optical receiver to convert the filtered third optical  
signal into an electrical signal having input data;

an electronic signal regenerator to generate an electrical  
data signal having the input data; and

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comit* a modem to produce the second electrical control signal in  
response to the electrical data signal.

33. (Previously Presented): The device as in claim 32,

wherein said electronic signal generator is coupled to receive  
an input from the label processing module and to drop input data  
of a selected WDM channel in response to the input.

34. (Previously Presented): The device as in claim 31,

wherein the label processing module comprises:

an optical receiver to convert the first optical signal  
into a first signal;

a label processor to process the first signal and to  
produce a new label;



a label writer to produce a label writing signal in response to the new label; and

a modulator to produce the first electrical control signal in response to the label writing signal.

35. (Currently Amended): A device, comprising:

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an optical input port to receive a wavelength-division multiplexed (WDM) signal having a plurality of different WDM channels within each single International Telecommunication Union (ITU) WDM window, wherein at least one of the WDM channels is empty and is reserved as a buffer channel;

an optical splitter to split the received WDM signal into first, second and third optical signals;

a label processing module to process label information in the first optical signal to produce an optical label signal which is modulated to carry new label information for a channel shifting arrangement;

an optical filter to filter the second optical signal to remove modulation bands thereon to produce an optical carrier signal;

a data signal regenerator to process data in each WDM channel in the third optical signal to generate an optical data

signal having data in the received WDM signal to shift a selected WDM channel to the buffer channel according to the channel shifting arrangement; and

an optical combiner to combine the optical label signal, ~~label~~ the optical carrier signal, and the optical data signal to produce a new WDM signal.

36. (Previously Presented): The device as in claim 35, wherein said label processing module comprises:

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an optical filter to filter the first optical signal to remove data and to retain label information;

an optical receiver to convert the filtered first optical signal into a first signal;

a label processor to process the first signal and to produce a new label;

a label writer to produce a label writing signal in response to the new label; and

a label optical transmitter responsive to the label writing signal to produce the optical label signal.

37. (Previously Presented): The device as in claim 35, wherein said data signal regenerator comprises:

an optical filter to filter and remove label information from the third optical signal;

an optical receiver to convert the filtered third optical signal into an electrical signal having input data;

an electronic signal regenerator to generate an electrical data signal having the input data; and

a data optical transmitter to produce the optical data signal in response to the electrical data signal.

38. (Previously Presented): A device, comprising:

an optical input port to receive a wavelength-division multiplexed (WDM) signal having a plurality of different WDM channels, wherein at least one of the WDM channels is empty and is reserved as a buffer channel and another of the WDM channels carries label information of the WDM signal;

an optical splitter to split the received WDM signal into a first optical signal and a second optical signal;

a first optical filter to filter the first optical signal to select the WDM channel that carries only the label information;

a second optical filter to filter the second optical signal to produce an optical data signal which carries data of each WDM channel without the label information;

an optical modulator to modulate the optical data signal at a selected local oscillator frequency to shift a selected WDM channel by the selected local oscillator frequency to fall within the buffer channel;

a label generator to produce a new optical label channel to reflect channel shifting done by said optical modulator; and

an optical combiner to combine the optical label channel and the optical data signal output from said optical modulator to produce a new WDM signal.

39. (Previously Presented): The device as in claim 38, wherein the optical modulator includes a Mach-Zehnder modulator.

40. (Previously Presented): A method, comprising:  
splitting a received wavelength-division multiplexed (WDM) signal into a first optical signal and a second optical signal, wherein the received WDM signal includes a plurality of different WDM channels within each single International

Telecommunication Union (ITU) WDM window and at least one of the WDM channel is empty and is reserved as a buffer channel;

filtering the first optical signal to produce an optical label signal which carries only label information of each WDM channel;

filtering the second optical signal to produce an optical data signal which carries data of each WDM channel without corresponding label information;

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cont* processing the optical data signal to shift a frequency of a selected WDM channel to the buffer channel in a new optical data signal;

producing a new optical label channel to reflect updated channel information after the shifting; and

combining the new optical label channel and the new optical data signal after the optical modulation to produce a new WDM signal.

41. (Currently Amended): A method, comprising:

providing a wavelength-division multiplexed (WDM) signal, wherein the WDM signal includes a plurality of different WDM channels, wherein at least one of the WDM channels is empty and

is reserved as a buffer channel and another of the WDM channels carries label information of the WDM signal;

splitting the WDM signal into a first optical signal and a second optical signal;

processing the first optical signal to obtain the label information and to modify the label information to swap labels of different WDM channels and to produce a new label signal;

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comit* ~~optically~~ modulating a laser beam in response to the new label signal to produce ~~an~~ a new optical label signal carrying the new label signal;

optically filtering the second optical signal to produce an optical data signal which carries data of each WDM channel without the label information; and

optically combining the optical data signal and the new optical label signal to a new WDM signal with swapped labels.

42. (Previously Presented): A device, comprising:

an optical input port to receive a wavelength-division multiplexed (WDM) signal having a plurality of different WDM channels, wherein at least one of the WDM channels is empty and is reserved as a buffer channel and another of the WDM channels carries label information of the WDM signal;

an optical splitter to split the received WDM signal into first, second and third optical signals;

a label processing module to process label information in the first optical signal to produce an electrical label signal which that swaps labels of different WDM channels;

an optical filter to filter the second optical signal to remove modulation bands thereon and to transmit an optical carrier signal;

an optical modulator to modulate the optical carrier signal in response to the electrical label signal to produce an optical label signal;

a data signal delay module to remove the label information from the third optical signal to produce a delayed optical data signal that carries the input data; and

an optical combiner to combine the optical label signal and the optical data signal to produce a new WDM signal with swapped labels.

43. (New) The device as in claim 42, wherein the WDM signal is an optical single sideband (OSSB) modulation signal and the optical modulator is an optical single sideband (OSSB) modulator, and wherein different WDM channels and a channel

carrying the label information are different modulation bands in the OSSB modulation signal.

44. (New) The method as in claim 41, wherein the WDM signal is an optical single sideband (OSSB) modulation signal and different WDM channels and a channel carrying the label information are different modulation bands in the OSSB modulation signal, the method further comprising using optical single sideband (OSSB) modulation to modulate the laser beam in producing the new optical label signal.

45. (New) The method as in claim 40, wherein the WDM signal is an optical single sideband (OSSB) modulation signal and different WDM channels, the buffer channel, and a channel carrying the label information are different modulation bands in the OSSB modulation signal.

46. (New) The device as in claim 38, wherein the WDM signal is an optical single sideband (OSSB) modulation signal and the optical modulator is an optical single sideband (OSSB) modulator, and wherein different WDM channels and a channel



carrying the label information are different modulation bands in the OSSB modulation signal.

47. (New) The device as in claim 31, wherein the WDM signal is an optical single sideband (OSSB) modulation signal and the optical modulator is an optical single sideband (OSSB) modulator, and wherein different WDM channels and a channel carrying the label information are different modulation bands in the OSSB modulation signal.

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48. (New) The device as in claim 47, wherein the data signal regenerator drops one data channel originally carried by one WDM channel from the second electrical control signal and adds a new data channel in the second electrical control signal to be added at a frequency of the one WDM channel in the new WDM signal.

49. (New) A method, comprising:

separating a received wavelength-division multiplexed (WDM) signal comprising a plurality of different WDM channels within a single International Telecommunication Union (ITU) WDM window into a first optical signal carrying a WDM channel that has

label information of the WDM channels, and a second optical signal at an optical carrier frequency without WDM channels, and a third optical signal comprising WDM channels carrying data and at least one empty WDM channel which is reserved as a buffer channel;

converting the third optical signal into an electronic data signal wherein a selected WDM channel is shifted to the buffer channel;

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mix* converting the first optical signal into an electronic label signal which has new label information to reflect updated channel information after channel shifting in electronic data signal; and

modulating the second optical signal to produce a new optical WDM signal having WDM channels therein which carry a new label channel with the updated channel information and data.

50. (New) The method as in claim 49, further comprising dropping data of a WDM channel and adding new data to the dropped WDM channel as a new WDM channel in the electronic data signal so that the new optical WDM signal carrying the new WDM channel.

51. (New) The method as in claim 49, wherein the WDM signal is an optical single sideband (OSSB) modulation signal and different WDM channels and a channel carrying the label information are different modulation bands in the OSSB modulation signal, and the method comprising performing an OSSB modulation on the second optical signal to produce the new optical WDM signal.

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52. (New) The method as in Claim 10, wherein each of the input and output optical signals is a wavelength-division multiplexed (WDM) signal comprising a plurality of different WDM channels within a single International Telecommunication Union (ITU) WDM window, and wherein each of the input and output channels occupies a WDM channel.

53. (New) The method as Claim 52, wherein each WDM signal is an optical single sideband (OSSB) modulation signal and different WDM channels and a channel carrying the label information are different modulation bands in the OSSB modulation signal.

54. (New) The device as in Claim 20, wherein each of the input and output optical signals is a wavelength-division multiplexed (WDM) signal comprising a plurality of different WDM channels within a single International Telecommunication Union (ITU) WDM window, and wherein each of the input and output channels occupies a WDM channel.

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55. (New) The device as Claim 54, wherein each WDM signal is an optical single sideband (OSSB) modulation signal and different WDM channels and a channel carrying the label information are different modulation bands in the OSSB modulation signal.

56. (New) A device, comprising:  
an optical module to receive and separate a received wavelength-division multiplexed (WDM) signal comprising a plurality of different WDM channels centered at different optical frequencies into a first optical signal carrying a WDM channel that has label information of the WDM channels, and a second optical signal carrying a first set of WDM channels, and a third optical signal comprising a second set of WDM channels

and at least one empty WDM channel which is reserved as a buffer WDM channel;

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a signal regeneration module comprising an optical detector to convert the third optical signal into an electronic data signal, an electronic signal regenerator which shifts a selected WDM channel of the second set of WDM channels to the buffer WDM channel, and a first optical transmitter responsive to an output from the electronic signal regenerator to produce a fourth optical signal carrying the second set of WDM channels with the selected WDM channel shifted to the buffer WDM channel;

a label generation module which converts the first optical signal into an electronic label signal and generates a new electronic label signal to indicate updated channel information in the fourth optical signal, the label generation module further comprising a second optical transmitter responsive to the new electronic label signal to produce an optical label signal carrying a label WDM channel with the updated channel information; and

an optical combiner to combine the second optical signal, the fourth optical signal, and the optical label signal to produce an output WDM signal having the label WDM channel, the first set of WDM channels, and the second set of WDM channels

with data in the selected WDM channel shifted to the buffer WDM channel and the selected WDM channel unoccupied.

57. (New) The device as in claim 56, wherein the optical module comprises an optical circulator, a label optical coupler, an optical label channel bandpass filter, a first optical bandpass filter, and a second optical bandpass filter,

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cont*  
wherein the optical circulator directs the received WDM signal to the first optical bandpass filter which transmits the first set of WDM channels and reflects rest of the received WDM signal back towards the optical circulator, wherein the label optical coupler splits reflected light to the optical label channel bandpass filter which transmits the first optical signal, and wherein the second optical bandpass filter receives and filters reflected light from the first optical bandpass filter directed by the optical circulator to produce the third optical signal.

58. (New) The device as in claim 56, wherein different WDM channels are carried by different optical carriers, respectively.

59. (New) A method for handling wavelength-division multiplexed (WDM) channels in an optical network, comprising:

providing an input port, a first optical path, a second optical path, and a third optical path;

using the input port to a WDM signal comprising a plurality of different WDM channels at different optical frequencies, wherein the WDM channels comprise a label WDM channel that has label information of the WDM channels and least one empty WDM channel which is reserved as a buffer WDM channel;

transmitting at least one pass-through WDM channel in the received WDM signal through the second optical path by blocking at least one selected WDM channel carrying data, the label WDM channel and the buffer WDM channel in the received WDM signal;

directing at least the selected WDM channel and the buffer WDM channel to the third optical path to generate a new WDM optical signal in which the data in selected WDM channel is removed from the selected WDM channel to leave the selected WDM channel unoccupied and the buffer WDM channel is used to carry data;

directing the label WDM channel into the first optical path to produce a new label WDM channel to indicate updated channel

information in the new WDM optical signal in the third optical path; and

combining the least one pass-through WDM channel in the second optical path, the new WDM signal in the third optical path, and the new label WDM channel in the first optical path to produce an output WDM signal with the selected WDM channel unoccupied.

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cont* 60. (New) The method as in claim 59, further comprising using an optical bandpass filter in the second optical path to filter the received WDM signal to achieve the transmitting and blocking.

61. (New) The method as in claim 59, further comprising:  
converting the label WDM channel into an electronic signal carrying the label information in the received WDM signal;  
modifying the electronic signal to update the label information according to the change in WDM channels in the third optical path; and

using the modified electronic signal to control an optical transmitter to generate the new label WDM channel.



62. (New) The method as in claim 59, wherein the generation of the new optical WDM signal in the third optical path comprises:

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concl.* converting light comprising at least the selected WDM channel and the buffer WDM channel in the third optical path into an electronic signal;

changing information in the electronic signal to change WDM channels; and

using the changed electronic signal to control an optical transmitter to produce the new optical WDM signal.

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